**Students demonstrate an understanding of Natural Selection/ evolution by…**  
  
**8a)** illustrating that when an environment changes, the survival advantage /disadvantage of some characteristics may change.

Required Prior Knowledge:

* Inheritance of characteristics
* Geological time scales

Potential Misconceptions:

HEREDITY:

1. Daughters inherit most of their characteristics from their mothers.  Boys inherit most of their characteristics from their fathers.
2. Variation between species is a result of adaptation to environment instead of inheritance.
3. Sexual reproduction occurs in animals but not in plants.
4. Students do not distinguish between sexual and asexual reproduction.
5. Asexual reproduction produces weak offspring.  Sexual reproduction produces superior offspring.
6. Students believe that transmitted characteristics are acquired during the life time of the animal.
7. Individuals can adapt to a changing environment.  These adaptations are heritable.
8. Students do not understand the relationship between DNA, genes, and chromosomes
9. Students can apply chance and probability to assigned genetics problems, but not to human situations in families.

Berthelsen, B. (1999). Students Naïve Conceptions in Life Science.   MSTA Journal, 44(1) (Spring’99), pp. 13-19.  http://www.msta-mich.org

ECOLOGY:

1. Stronger organisms have more energy.
2. There are more herbivores because they have more offspring.
3. A species high on the food web is a predator to everything below it.
4. Energy accumulates in an ecosystem so that a top predator has all the energy from the organisms below it.
5. Carnivores can exist in a plant free world if their prey reproduce enough.
6. The food that is eaten and used as a source of energy is part of the good chain; food that is synthesized into the body of the eater is now food for the next level.

Berthelsen, B. (1999). Students Naïve Conceptions in Life Science.   MSTA Journal, 44(1) (Spring’99), pp. 13-19.  http://www.msta-mich.org

**8b)** distinguish between microevolution (on small scale within a single population –e.g., change in gene frequency within a population)

and macroevolution (on a scale that transcends boundaries of a single species – e.g., diversity of all beetle species within the order of insects)

and explain how macroevolution accounts for speciation and extinction.

Required Prior Knowledge:

* Differentiate between individual, population, community

Potential Misconceptions:

1. Students have difficulty relating an individuals adaptation to environment with changes in species phenotypes over long period of time due to selection.
2. Students believe that transmitted characteristics are acquired during the life time of the animal.
3. Individuals can adapt to a changing environment.  These adaptations are heritable.

Berthelsen, B. (1999). Students Naïve Conceptions in Life Science.   MSTA Journal, 44(1) (Spring’99), pp. 13-19.  http://www.msta-mich.org

**8c)** recognizing patterns in molecular and fossil evidence, to provide a scientific explanation for Natural Selection and its evolutionary consequences (e.g. survival, adaptation).

Required Prior Knowledge:

Potential Misconceptions:

**Students demonstrate an understanding of classification of organisms by …**  
  
**8d)** using data or models (charts, diagrams, table, narratives etc.) to analyze how organisms are organized into a hierarchy of groups and subgroups based on evolutionary relationships. (e.g. creating a taxonomic key to organize a given set of examples).

Required Prior Knowledge:

Potential Misconceptions: